

**United States Naval Academy  
Mechanical Engineering Department**

**EM476 Undersea Power Systems**

**Catalog Description:** EM476 Undersea Power Systems

**Credit:** 3 (3-0-3)

The principles of design of undersea power systems are presented. Topics include batteries, fuel cells, thermoelectrics, magnetohydrodynamics, thermophotovoltaics and OTEC.

**Prerequisites:** EM332, EM318 or EM324, EN245 or permission of department chair.

**Textbooks:** No text required.

**Course Director:** Prof. K. W. Lindler

**Objectives<sup>1</sup>:**

1. To introduce the student to advanced power systems and energy conversion techniques which have application to underwater vehicles and environments. (a, b, c)
2. To study the principles of direct energy conversion. (a, b, c)
3. To review current literature in the advance power systems, energy conversion and energy storage areas. (a, b, c, d)

**Course Content:**

No.	Topic or Subtopic	hrs.
1	Undersea Power Systems Requirements	3
2	Batteries	2
3	Fuel Cells	4
4	Magnetohydrodynamics	8
5	Thermoelectric Converters	9
6	Ocean Thermal Energy Conversion	5
7	Thermophotovoltaics	2
8	Recent Advances in Energy Conversion	6

**Evaluation:**

1. Homework
2. Exams
3. Oral Presentations
4. Term Paper

**Acquired Abilities<sup>2</sup>:**

1. Students will demonstrate the ability to choose a suitable energy conversion device to meet power requirements and mission duration for any undersea application. (1, 2)

## EM476 Undersea Power Systems

2. Students will demonstrate the ability to apply the first law and second law of thermodynamics to thermochemical energy conversion devices such as batteries and fuel cells. (1, 2)
3. Students will demonstrate the ability to analyze and design and optimize MHD generators, thermoelectric generators, thermoelectric heat pumps and OTEC power plants. (1, 2)
4. Students will demonstrate the ability to explain the fundamental principles of thermophotovoltaic energy converters as well as other recent advances in energy conversion. (1, 2, 3, 4)

**Date of Latest Revision:** 5 Nov 2001

<sup>1</sup> Letters in parenthesis refer to the [Program Objectives](#) of the [Mechanical Engineering Program](#).

<sup>2</sup> Numbers in parenthesis refer to the evaluation methods used to assess student performance.